

# 6.003: Signal Processing

## Quiz Review Questions

*October 28, 2021*

## Continuous-Time Fourier Transform

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Property	$y(t)$	$Y(\omega)$
Linearity	$ax_1(t) + bx_2(t)$	$aX_1(\omega) + bX_2(\omega)$
Time reversal	$x(-t)$	$X(-\omega)$
Time delay	$x(t - t_0)$	$e^{-j\omega t_0} X(\omega)$
Conjugation	$x^*(t)$	$X^*(-\omega)$
Scaling time	$x(at)$	$\frac{1}{ a } X\left(\frac{\omega}{a}\right)$
Time derivative	$\frac{dx(t)}{dt}$	$j\omega X(\omega)$
Frequency derivative	$tx(t)$	$j\frac{d}{d\omega} X(\omega)$

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## Discrete-Time Fourier Transform

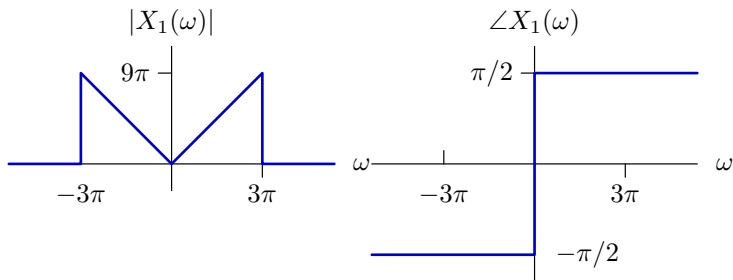
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Property	$y[n]$	$Y(\Omega)$
Linearity	$ax_1[n] + bx_2[n]$	$aX_1(\Omega) + bX_2(\Omega)$
Time reversal	$x[-n]$	$X(-\Omega)$
Time delay	$x[n - n_0]$	$e^{-j\Omega n_0} X(\Omega)$
Conjugation	$x^*[n]$	$X^*(-\Omega)$
Frequency derivative	$nx[n]$	$j\frac{d}{d\Omega} X(\Omega)$

## Fourier Transforms: Part 1

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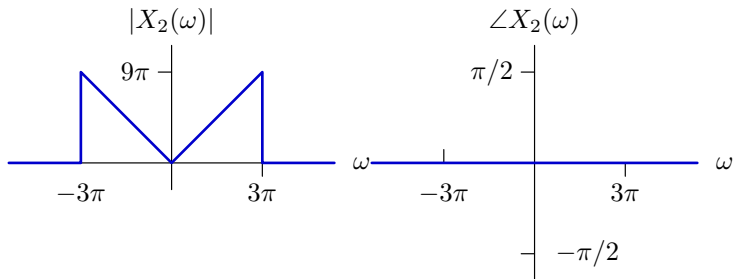
Determine the signal  $x_1(t)$  whose Fourier transform  $X_1(\omega)$  has the following magnitude and angle.



Express  $x_1(t)$  as a closed-form function of time.

## Fourier Transforms: Part 2

Determine  $x_2(t)$ , whose Fourier transform  $X_2(\omega)$  has the following magnitude and angle.



Express  $x_2(t)$  as a closed-form function of time.

# Match the Time Waveforms (left) with their CTFTs (right).

